Field and Laboratory Data from an Earthquake History Study of the Toe Jam Hill Fault, Bainbridge Island, Washington

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Introduction and Data Tables 1 and 2
(8.5x11-inch paper format)

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INTRODUCTION

The Seattle fault zone, which extends at least 70 km east-west through the central Puget Lowland and metropolitan Seattle (Figure 1), is one of a number of poorly understood fault zones that pose potential earthquake hazards to life and property in the lowland (Gower and others, 1985; Johnson and others, 1996,1999; Sherrod and others, 2000; Bourgeois and Johnson, 2001; Brocher and others, 2001). The northernmost fault in the Seattle fault zone produced an earthquake of at least magnitude 7 between AD 900 and 930 (Bucknam and others, 1992; Atwater and Moore, 1992; Atwater, 1999), but whether or not other large Holocene earthquakes have occurred on faults in the zone—and, if so, their frequency and periodicity—are the subject of debate (Thorson, 1996; Sherrod and others, 2000). New Airborne Laser Scanner Mapping (ALSM) imagery has led to the discovery of the first Holocene fault scarp in the Seattle fault zone, on Bainbridge Island 15 km west of downtown Seattle (Bucknam and others, 1999; Harding and Berghoff, 2000). This discovery makes standard methods of trenching the active surface traces of faults (for example, McCalpin, 1998) practical for the first time in the Puget Lowland. Study of stratigraphic and structural relations in trenches across fault scarps is the most direct way of deciphering the history of large earthquakes on faults. Such histories are critical in the assessment of regional earthquake hazards.

This map presents primary field and laboratory data and interpretations of stratigraphic unit genesis and structural relations that are being used to develop a latest Pleistocene and Holocene history of large earthquakes on the Toe Jam Hill fault in the Seattle fault zone. The fault extends east-west for about 2.6 km across the southern tip of Bainbridge Island (Figure 2, Plate 1). Two trenches excavated across the scarp of the Toe Jam Hill fault were studied in 1998 (Bear’s Lair and Saddle, Plate 2), and in 1999 we completed the study of three more. Types of data presented include: logs (maps of vertical or sloping walls) of the five trenches; lithologic, grain-size distribution, sedimentary and tectonic structures, and radiocarbon data for trench stratigraphic units; topographic profiles measured across the fault scarp at each trench site; and descriptions of soil profiles in and near each trench. The map does not show how surface faulting and folding events identified in each trench may correlate among trenches or attempt to use the primary data presented to develop an earthquake history for the Toe Jam Hill fault. These latter objectives, and how they impact earthquake hazard assessment in the Puget Lowland, are the subject of a future report. Preliminary conclusions about the earthquake history of the Toe Jam Hill fault are reported by Nelson and others (2000).

The map consists of two plates and two text files of data tables. This is the first text file, which includes a brief introduction. Each of the plates and files is available as a separate file (four total) in portable document format (PDF). Plate 1 includes a trench site location figure (Figure 2) derived from ALSM imagery data and the log of the west wall of the Crane Lake trench. Also included on Plate 1 are topographic profiles measured in the field across the scarp of the Toe Jam Hill fault at four of the trench sites and one other location (methods of Machette, 1989). For comparison, two similar profiles were measured directly from the upper edge of two of the completed trench logs. Plate 2 contains the logs of the west walls of the Blacktail and Bear’s Lair trenches and the east walls of the Mossy Lane and Saddle trenches. Plate 2 also includes an explanation of the colors used to show inferred genesis of stratigraphic units on the trench logs. Methods used to map the trench walls are similar to those described by McCalpin (1998, p. 56-75). The upper 1-3 meters of the west wall of the Crane Lake trench was sloped 5-40º from vertical for safety; on the trench log (Plate 1) stratigraphy has been projected as much as 2 m eastward into the vertical plane of the lower part of the trench. Adjacent to each log is a summary explanation of stratigraphic units and symbols used on the log and notes about important stratigraphic relations or interpretations of units. Note that neither the colors nor the numbers used to label stratigraphic units imply direct chronologic correlation of units from trench to trench. We do, however, infer a similar genesis for units of the same color on different logs. Units on logs follow geologic convention in being numbered from oldest to youngest; unit explanations are presented from left to right and top to bottom to increase readability on plates with limited space.

The two text files of data tables include additional field and laboratory data for samples from stratigraphic units in the trenches and soil profiles described in and near the trenches. Except for Table 4, tables are numbered with letters that identify the trench (CL – Crane Lake trench, BT – Blacktail trench, BL – Bear's Lair trench, ML – Mossy Lane trench, S – Saddle trench) and a number. Radiocarbon data are presented in tables numbered with a "1" (for example, CL1, ML1). Tables numbered with a "2" list field and laboratory properties of soil profiles. The large-format (11x17-inch paper) tables numbered with a "3" include detailed lithologic and related information about stratigraphic units not shown on the trench logs. Although we worked to standardize the terms used and the degree of detail described for particular properties in the unit descriptions (tables numbered with a "3"), some inconsistencies remain because the trenches were described over limited periods of time by investigators with different backgrounds and interests. Table 4 includes brief descriptions and interpretations of fossils (pollen, diatoms, vascular plant fragments) found in samples from the trenches that help in determining the genesis and age of units. Most of the 48 sieved samples that were barren of fossils or yielded only charcoal fragments are not listed on Table 4 or marked on the trench logs because such samples provide little information about paleoenvironments. Sieved samples whose charcoal was successfully ^{14}C-dated are listed on tables numbered "1" and marked by triangles on the trench logs. In general, tables do not repeat information that is shown on the trench logs or in other tables. References to methods of description and analysis are included in the notes at the bottom of tables. These and other cited references are listed below.

This file (Introduction and Data Tables 1 and 2) should be printed on 8.5x11-inch paper. The other text file (Data Tables 3 and 4) includes the large-format tables that need to be printed on 11x17-inch paper.

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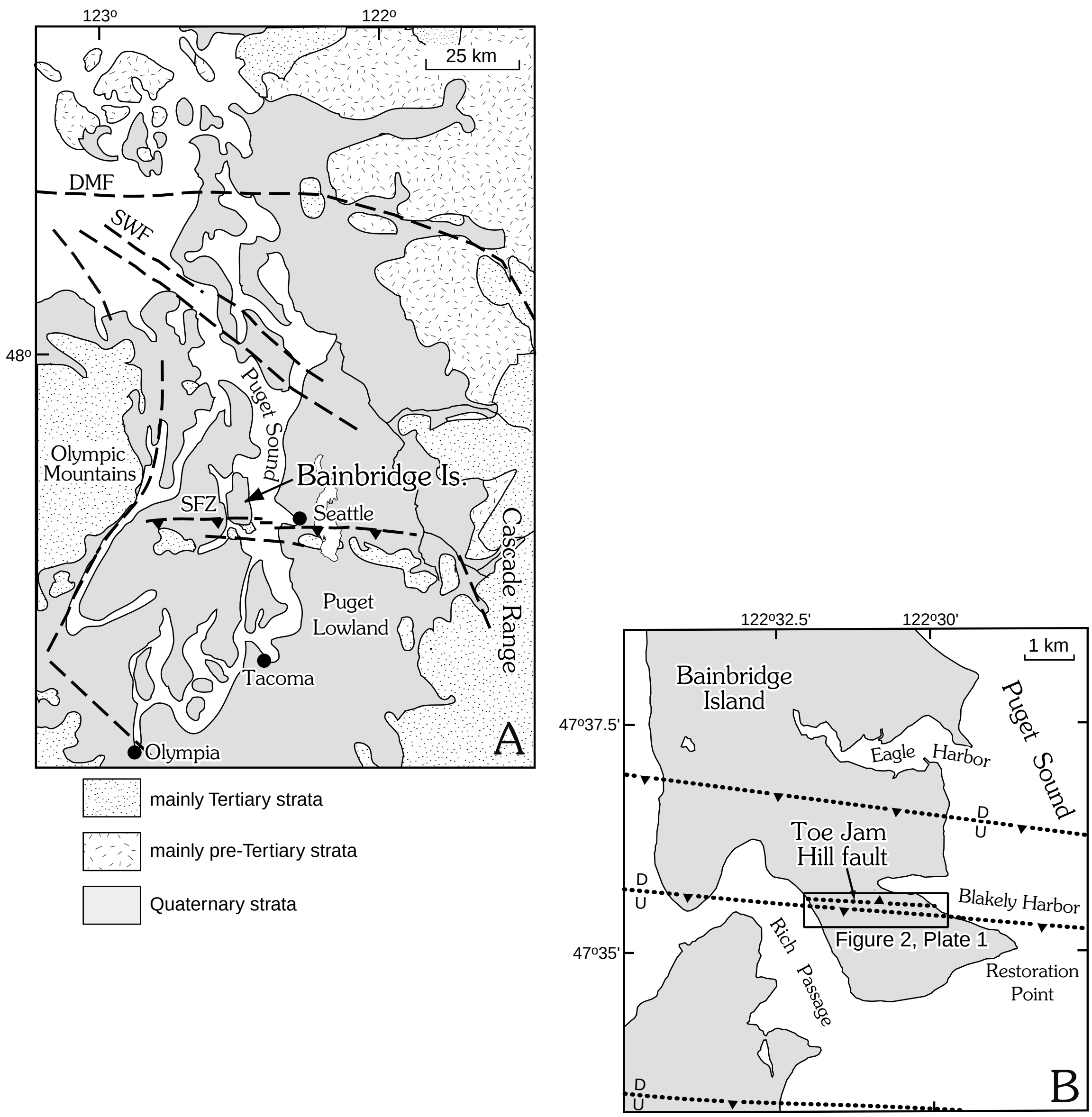

Figure 1. A, Generalized geologic map of the Puget Lowland region showing location of Bainbridge Island and selected regional crustal faults (dashed lines; after Bourgeois and Johnson, 2001). Abbreviations: DMF-Devils Mountain fault; SFZ-Seattle fault zone; SWF-southern Whidbey Island fault. B, Map showing the location of the Toe Jam Hill fault on southern Bainbridge Island and the area of Figure 2 on Plate 1. Barbed dashed lines (barbs point downdip) show major reverse faults within the Seattle fault zone (Johnson et al., 1999) where it extends across southern Bainbridge Island.

Table CL1. Radiocarbon data for samples from the Crane Lake trench

Field No.	Unit No.	Station (m)[1]	Radiocarbon Lab No.[2]	Lab-reported age (^{14}C yr BP at 1σ)[3]	Calibrated age (cal yr BP at 2σ)[4]	Sample weight (mg)[5]	^{13}C (‰)	Description of dated material[6]
CL-66	14d	14.6, 6.3 se	OS-28476	1810±45	1870-1600	15.5	-26.9	Six fragments *
CL-48	14bAB	12.80, 4.95	OS-23307	1290±30	1290-1170	11.0	-23.0	Two fragments
CL-45	14a	12.05, 4.17	OS-23309	1060±30	1060-920	12.9	-24.4	Clean fragment
CL-46	14a	12.22, 3.86	GX-26082	1240±50	1290-1050	94.7	-23.3	Fragment
CL-55	13eBw	13.88, 6.00	OS-23312	1390±35	1360-1240	21.9	-24.6	Part of charred conifer seed??
CL-63	13bAB	13.3, 6.0 se	OS-28475	575±40	650-520	18.4	-29.4	Five fragments charred wood and charcoal*
CL-49	12	13.10, 5.61	OS-23305	1290±30	1290-1170	12.2	-24.5	Fragment
CL-14	12	13.40, 5.88	GX-26081	1470±40	1490-1290	88.2	-25.3	Three fragments
CL-56D	10	14.69-79, 5.55-60	Beta- 141778	1520±40	1520-1310	33.4	-29.8	Fragments, largest with twig morphology*
CL-56C	10	14.69-79, 5.55-60	OS-23303	1680±30	1700-1520	5.6	-23.9	Two fragments*
CL-12	10	13.65, 5.22	OS-23306	1896±19	1900-1730	62.5	-24.9	Resinous fragment of charcoal
CL-51	10	14.20, 5.48	GX-26073	2920±40	3210-2940	16.7	-25.1	Dense, resinous charcoal fragments
CL-57	9A	15.3, 5.5	GX-26074	1940±40	2000-1810	193.3s	-22.1	Decayed soft fragments
CL-58	9A	15.4, 5.85	Beta-137174	1810±60	1880-1560	9.3 grams	-25est	Pieces of clean charcoal
CL-44B	9A	15.33, 5.51	Beta-141777	1990±40	2050-1820	40.1	-26.0	Decayed fragment
CL-44A	9A	15.33, 5.51	OS-24762	2010±30	2050-1880	44.9	-25.5	Decayed fragment
CL-59	8c	13.15, 4.7	OS-23310	4020±35	4580-4410	10.1	-23.6	Fragment within soil ped
CL-59B	8c	13.15, 4.7	OS-27228	5050±85	5930-5600	40.5	-24.2	Fragments
CL-47	8b	12.58, 4.40	GX-26072	2440±30	2720-2350	9.9	-26.7	Fragment
CL-50	7A	13.45, 4.65	OS-23302	2550±30	2760-2490	16.1	-25.2	Clean fragment
CL-52A	7A	13.25-37, 4.42-49	OS-23290	3090±35	3390-3210	10s	-25.1	Wood and herb charcoal fragments
CL-52B	7A	13.25-37, 4.42-49	OS-28474	5010±50	5900-5610	24.4	-26.0	Ten fragments charcoal*
CL-53	7A	14.02-24, 4.68-73	OS-26217	5240±320	6750-5250	10s#	-24.3	Charcoal-rich, 2-mm-thick laminae*
CL-35	6c	10.10, 3.18	OS-28473	2390±50	2720-2330	32.0	-26.4	Seven fragments*
CL-40	6bA	12.06, 3.37	GX-26071	2850±40	3140-2850	42.9	-23.9	Fragment
CL-36	6a	11.97, 3.82	OS-25344	1700±50	1740-1510	74.0	-24.3	Dense subangular fragments*
CL-2	1b	22.8, 6.2 opp wall	OS-24707	26,600±150	--	141.7	-25.3	Fragments sheared resinous charcoal

[1]Location (horizontal, vertical) on reference grid used to map west wall of the trench. Dashes indicate horizontal and vertical range over which sediment sample (from which charcoal was extracted) was collected. "opp wall" indicates approximate location (within the plane of the west-wall grid) of samples from the east wall of the trench, which was not mapped in detail. Superscripts on sample ages shown on Plates 1 and 2 are the digits of field sample numbers (first column). Ages shown on inset of second exposure on Plate 1 are marked with "se".

[2]Laboratories are: OS, National Ocean Sciences AMS Facility, Woods Hole Oceanographic Institution; GX, Geochron Laboratories, Cambridge, Massachusetts (above group of GX samples analyzed on an accelerator at Lawrence Livermore National Laboratories); Beta, Beta Analytic, Inc., Miami, Florida.

[3]AMS (accelerator mass spectrometer) ages (methods described in Gagnon et al., 2000), except for sample CL-58, which is a conventional liquid-scintillation age. ^{13}C was assumed to be –25.0‰ for the latter age. Quoted error for each AMS analysis is the larger of counting error or target reproducibility error. NOSAMS' (OS-) tests of reproducibility on seawater and coral samples show total errors of 2.2-5.8% (Elder et al., 1998). Reported age for CL-12 is the average of three ages on the same charcoal fragment.

[4]Ages in solar years calculated using OxCal (version 3.4; Bronk Ramsey, 1998; probability method) with the INTCAL98 dataset of Stuiver et al. (1998). NOSAMS and Lawrence Livermore's (GX-) results from the Third International Radiocarbon Comparison show minimal offset from comparison means (e.g., Elder et al., 1998) suggesting that no additional interlaboratory variance (error multiplier, e.g., Taylor et al., 1996) is required for calibration. Although Beta Analytic, Inc. states that no additional error need be added to its ages for calibration, Beta's results from international radiocarbon comparisons remain unreported. Calibrated ages show time intervals of >95% probability distribution at 2σ. Ages shown on Plates 1 and 2 are midpoints of time intervals rounded to nearest 100 years.

[5]"s" indicates samples with adhering sediment when submitted; weight is a maximum for organic material in the sample. "#" indicates samples containing little (<150 ug) carbon.

[6]Unless indicated otherwise, ages are on unabraded fragments of wood charcoal. In each sample, the largest, most angular, least decayed fragments of charcoal, wood, and/or herb parts were selected to minimize the chance of analyzing carbon much older than the host sediment. In most samples, fragments with root-like morphology were avoided to minimize the chance of analyzing roots much younger than the host sediment. Except for a few of the most delicate fragments, sediment adhering to fragments was removed with brushes or dental tools in distilled water at 12-50X. Most charcoal was picked directly from moist sediment collected from the trench wall. Asterisk indicates samples that were picked from 1-mm and/or 0.5-mm sieves following wet sieving of bulk sediment samples (50-800 g sediment).

Table BT1. Radiocarbon data for samples from the Blacktail trench

Field No.	Unit No.	Station (m)[1]	Radiocarbon Laboratory No.[2]	Lab-reported age (^{14}C yr BP at 1σ)[3]	Calibrated age (cal yr BP at 2σ)[4]	Sample weight (mg)[5]	^{13}C (‰)	Description of dated material[6]
BT-59	11aB/E	21.0, 5.2	OS-23301	1960±35	2000-1820	9.3	-29.7	Fragment
BT-53	10b	11.7, 2.85	Beta-141688	290±50	480-150	18 grams	--	Large pieces of charcoal and charred wood
BT-54	10b	12.2, 2.95	Beta-137175	980±80	1060-720	6.5 grams	--	Pieces of charcoal
BT-55	10b	12.95, 3.2	Beta-141689	230±50	440-0	52 grams	--	Large pieces of charcoal and charred wood
BT-51	10a	11.6, 2.6	OS-23308	1340±45	1330-1170	34.7	-25.1	Fragment
BT-50	9bB/E	10.1, 2.1	GX-26089	1320±40	1300-1170	18.8	-21.3	Two fragments of slightly abraded wood
BT-48	9bB/E	9.6, 2.0	OS-25442	315±40	470-290	32.4	-25.7	Fragment
BT-46	9aAE	19.4, 4.6	OS-28471	6980±70	7940-7670		-24.5	100 wood and leaf charcoal fragments*
BT-64A	7dA	10.7, 1.8	OS-25439	55±40	270-0	21.7	-26.6	Three fragments light-brown abraded wood*
BT-64B	7dA	10.7, 1.8	OS- 24904	8600±75	9780-9470	11.1	-24.7	Six fragments*
BT-57	7cA	20.5, 4.6	OS-25343	9800±90	11,600-10,750	18.8	-23.4	Fragment
BT-58	7cA	19.5, 4.3	OS-25270	9912±30	11,550-11,200	22.5	-23.5	Fragment
BT-43	6b	14.1, 2.4	CAMS-70169	47,800±1900	--	5.3s#	-22.6	13 tiny fragments*
BT-6	5c	24.7, 2.9	GX-26088	160±40	290-0	26.4	-27.9	8-cm-long, black, *Equisetum* sp. root sheath
BT-3	4b	29.1, 3.1	Beta-141776	12,140±40	15,350-13,750	14.3s	-25.6	Charcoal twig and fragments*
BT-1	1a	26.8, 2.7	GX-26080	>46,900	--	52.9	-25.3	Fragment of charred wood

[1]Location (horizontal, vertical) on reference grid used to map west wall of the trench. Superscripts on sample ages shown on Plates 1 and 2 are the digits of field sample numbers (first column).

[2]Laboratories are: OS, National Ocean Sciences AMS Facility, Woods Hole Oceanographic Institution; CAMS, Lawrence Livermore National Laboratories; GX, Geochron Laboratories, Cambridge, Massachusetts (GX samples above analyzed on an accelerator at Lawrence Livermore National Laboratories); Beta, Beta Analytic, Inc., Miami, Florida.

[3]AMS (accelerator mass spectrometer) ages (methods described in Gagnon et al., 2000), except for samples BT-53, BT-54, and BT-55, which are conventional liquid-scintillation ages. ^{13}C was assumed to be –25.0‰ for the latter ages. Quoted error for each AMS analysis is the larger of counting error or target reproducibility error. NOSAMS' (OS-) tests of reproducibility on seawater and coral samples show total errors of 2.2-5.8% (Elder et al., 1998). Reported age for BT-58 is the average of two ages on the same fragment.

[4]Ages in solar years calculated using OxCal (version 3.4; Bronk Ramsey, 1998; probability method) with the INTCAL98 dataset of Stuiver et al. (1998). NOSAMS and Livermore's (GX-, CAMS-) results from the Third International Radiocarbon Comparison show minimal offset from comparison means (e.g., Elder et al., 1998) suggesting that no additional interlaboratory variance (error multiplier; e.g., Taylor et al., 1996) is required for calibration. Although Beta Analytic, Inc. states that no additional error need be added to its ages for calibration, Beta's results from international radiocarbon comparisons remain unreported. Calibrated ages show time intervals of >95% probability distribution at 2σ. Ages shown on Plates 1 and 2 are midpoints of time intervals rounded to nearest 100 years.

[5]"s" indicates samples with adhering sediment when submitted; weight is a maximum for organic material in the sample. "#" indicates samples containing little (<150 ug) carbon.

[6]Unless indicated otherwise, ages are on unabraded fragments of wood charcoal. In each sample, the largest, most angular, least decayed fragments of charcoal, wood, and/or herb parts were selected to minimize the chance of analyzing carbon much older than the host sediment. In most samples, fragments with root-like morphology were avoided to minimize the chance of analyzing roots much younger than the host sediment. Except for a few of the most delicate fragments, sediment adhering to fragments was removed with brushes or dental tools in distilled water at 12-50X.. Most charcoal was picked directly from moist sediment collected from the trench wall. Asterisk indicates samples that were picked from 1-mm and/or 0.5-mm sieves following wet sieving of bulk sediment samples (50-800 g).

Table BL1. Radiocarbon data for samples from the Bear's Lair trench

Field No.	Unit No.	Station (m)[1]	Radiocarbon Laboratory No.[2]	Lab-reported age (^{14}C yr BP at 1σ)[3]	Calibrated age (cal yr BP at 2σ)[4]	Sample weight (mg)[5]	^{13}C (‰)	Description of dated material[6]
ARN98-60B	9cA	9.79, 1.12	Beta-125831	1160±50	1230-960	12.9	-24.8	*Thuja plicata* leaf attached to block of mud
ARN98-60C	9cA	9.79, 1.12	GX-26075	1590±40	1570-1380	7.7	-23.8	Decayed wood in 2-cm block of peaty mud
ARN98-58A	9cA	9.69, 2.06	GX-26076	2030±40	2120-1880	35.4s	-26.4	Charcoal in block of peaty mud
SP98-6	9bA	9.0, 3.1	Beta-123796	290±40	470-150	4 grams	-27.6	Fragments
ARN98-61	6E	7.24, 2.90	OS-27229	4780±40	5600-5330	22.1s	-26.3	10-12-mm fragments
BL-4	5d	1.4, 1.5	OS-28470	5730±35	6640-6410	26.8	-25.9	3 5-10-mm-long fragments*
ARN98-73A	5cA	3.5, 1.8 op	OS-25441	>modern		3.9	-25.9	Cedar leaf, deciduous leaf frag*
ARN98-73B	5cA	3.5, 1.8 op	OS-25279	7530±40	8410-8200	43.5	-27.1	Fragments*
ARN98-72A	5b	1.9, 1.6 op	OS-24807	7190±42	8150-7870	18.1	-26.1	Fragments*
ARN98-72B	5b	1.9, 1.6 op	OS-24772	>modern	--	5.8	-27.8	Fragments of root sheaths and leaves*
SP98-3	5b	3.0, 1.6 op	Beta-123795	>42,100	--	28 grams	-24.0	Large knot of burned wood
ARN98-45B	5b	-0.6, 1.4	Beta-125830	6680±50	7660-7430	39.7	-26.5	Deciduous leaf base and wood fragments
ARN98-45EA	5b	-0.6, 1.4	OS-25342	7040±65	7970-7690	20.7	-28.3	Fragments*
ARN98-59A	5b	3.7, 1.62	OS-25440	9980±95	12,000-11,500	11.0	-26.6	Fragments of herb/wood charcoal*
BL-2	4	1.0, 1.2	CAMS-70167	3030±40	3350-3070	10.8s	-26.2	22 <1-mm clean wood charcoal fragments*
BL-5	3	12.0, 2.4	CAMS-70168	41,800±2500	--	4.9s	-25.7	3 1-mm abraded fragments*

[1]Location (horizontal, vertical) on reference grid used to map west wall of the trench. "op" indicates approximate location (within the plane of the west-wall grid) of samples from the east wall of the trench, which was not mapped in detail. Superscripts on sample ages shown on Plates 1 and 2 are the final digits of field sample numbers (first column).

[2]Laboratories are: OS, National Ocean Sciences AMS Facility, Woods Hole Oceanographic Institution; CAMS, Lawrence Livermore National Laboratories; GX, Geochron Laboratories, Cambridge, Massachusetts (GX samples above analyzed on an accelerator at Lawrence Livermore National Laboratories); Beta, Beta Analytic, Inc., Miami, Florida.

[3]AMS (accelerator mass spectrometer) ^{14}C ages (methods described in Gagnon et al., 2000), except for samples SP98-6 and SP98-3, which are conventional liquid-scintillation ages. Quoted error for each AMS analysis is the larger of counting error or target reproducibility error. NOSAMS' tests of reproducibility on seawater and coral samples show total errors of 2.2-5.8% (Elder et al., 1998). Reported age for ARN98-72A is the average of two ages on the same charcoal fragment.

[4]Ages in solar years calculated using OxCal (version 3.4; Bronk Ramsey, 1998; probability method) with the INTCAL98 dataset of Stuiver et al. (1998). NOSAMS and Lawrence Livermore's (GX-, CAMS-) results from the Third International Radiocarbon Comparison show minimal offset from comparison means (e.g., Elder et al., 1998) suggesting that no additional interlaboratory variance (error multiplier; e.g., Taylor et al., 1996) is required for calibration. Although Beta Analytic, Inc. states that no additional error need be added to its ages for calibration, Beta's results from international radiocarbon comparisons remain unreported. Calibrated ages show time intervals of >95% probability distribution at 2σ. Ages shown on Plates 1 and 2 are midpoints of time intervals rounded to nearest 100 years.

[5]"s" indicates samples with adhering sediment when submitted; weight is a maximum for organic material in the sample. "#" indicates samples containing little (<150 ug) carbon.

[6]Unless indicated otherwise, ages are on unabraded fragments of wood charcoal. In each sample, the largest, most angular, least decayed fragments of charcoal, wood, and/or herb parts were selected to minimize the chance of analyzing carbon much older than the host sediment. In most samples, fragments with root-like morphology were avoided to minimize the chance of analyzing roots much younger than the host sediment. Except for a few of the most delicate fragments, sediment adhering to fragments was removed with brushes or dental tools in distilled water at 12-50X. Most charcoal was picked directly from moist sediment collected from the trench wall. Asterisk indicates samples that were picked from 1-mm and/or 0.5-mm sieves following wet sieving of bulk sediment samples (50-800 g sediment).

Table ML1. Radiocarbon data for samples from the Mossy Lane trench

Field No.	Unit No.	Station (m)[1]	Radiocarbon Lab No.[2]	Lab-reported age (^{14}C yr BP at 1σ)[3]	Calibrated age (cal yr BP at 2σ)[4]	Sample weight (mg)[5]	^{13}C (‰)	Description of dated material[6]
ML-5	4dA	15.98-2.51	OS-27359	1230±30	1270-1060	46.7	-25.9	Charred bark
ML-9	4dA	13.54-70, 2.80	GX-26085	1570±40	1540-1350	35.6	-22.9	Two fragments
ML-54	4dA	13.1-5, 2.7-8	OS-25852	1300±21	1290-1170	108	-22.1	Outermost 7-10 rings of charcoal log
ML-2	4dB	15.42, 2.41	GX-26084	2950±40	3250-2960	24.5	-24.5	Two fragments
ML-50	4cAB	12.7-13.5, 3.75-85	OS-26649	8190±200	9550-8550	1.4s#	-23.6	30 tiny charcoal fragments*
ML-14	4bAEB	11.87-97, 4.29	GX-26086	1370±50	1370-1170	8.2	-24.0	12-mm-long fragment
ML-16	4bAEB	11.48-61, 4.22-24	Beta-141780	1500±40	1520-1300	13.9	-23.7	Thin fragments of charcoal
ML-49B	4aAB	11.2-6, 4.48-58	OS-28472	4050±50	4810-4410	47.6	-24.5	Hundreds of 0.2-mm flakes*
ML-18	4aAB	11.36-56, 4.46-50	OS-31158	>modern	--	34.3	-27.0	Fragments of abraded wood, possibly roots*
ML-51A	2AEB	10.0-8, 4.2-5	OS-25852	1360±85	1420-1060	11.2	-29.4	Charcoal twig*
ML-51B	2AEB	10.0-8, 4.2-5	Beta-141781	1360±40	1350-1170	20.0	-24.6	Three 3-mm-long fragments*
ML-17	2AEB	10.30, 4.29	GX-26083	1760±50	1820-1550	32.8	-25.4	One quarter of 15-mm-long fragment
ML-7	2AEB	10.55-68, 4.38-40	OS-25648	1440±90	1530-1170	7.5s	-27.1	Knobby charcoal twig
ML-46	2AEB	9.05-95, 4.8-5.0	OS-25649	1590±110	1730-1280	11.3	-25.9	Clean fragments of charcoal*
ML-48	2AEB	9.1-5, 4.6-9	OS-25812	1240±35	1270-1060	18.3	-26.6	43 seeds or fecal pellets*
ML-19	2AEB	9.25, 4.76	GX-26087	1410±40	1390-1260	10.2	-26.9	5-mm-long fragment
ML-1	1fA	24.44, 1.78	Beta-141779	>52,390		56.8	-24.0	Wood and dense, glassy charcoal*

[1]Location (horizontal, vertical) on reference grid used to map west wall of the trench. Superscripts on sample ages shown on Plates 1 and 2 are the digits of field sample numbers (first column).

[2]Laboratories are: OS, National Ocean Sciences AMS Facility, Woods Hole Oceanographic Institution; GX, Geochron Laboratories, Cambridge, Massachusetts (GX samples above analyzed on an accelerator at Lawrence Livermore National Laboratories); Beta, Beta Analytic, Inc., Miami, Florida.

[3]AMS (accelerator mass spectrometer) ^{14}C ages (methods described in Gagnon et al., 2000). Reported age for ML-54 is the average of four ages on two adjacent samples of the outer 7-10 rings of a charcoal log. Quoted error for each AMS analysis is the larger of counting error or target reproducibility error. NOSAMS' (OS-) tests of reproducibility on seawater and coral samples show total errors of 2.2-5.8% (Elder et al., 1998).

[4]Ages in solar years calculated using OxCal (version 3.4; Bronk Ramsey, 1998; probability method) with the INTCAL98 dataset of Stuiver et al. (1998). NOSAMS and Lawrence Livermore's (GX-) results from the Third International Radiocarbon Comparison show minimal offset from comparison means (e.g., Elder et al., 1998) suggesting that no additional interlaboratory variance (error multiplier; e.g., Taylor et al., 1996) is required for calibration. Although Beta Analytic, Inc. states that no additional error needs to be added to its ages for calibration, Beta's results from international radiocarbon comparisons remain unreported. Calibrated ages show time intervals of >95% probability distribution at 2σ. Ages shown on Plates 1 and 2 are midpoints of time intervals rounded to nearest 100 years.

[5]"s" indicates samples with adhering sediment when submitted; weight is a maximum for organic material in the sample. "#" indicates samples containing little (<150 ug) carbon.

[6]Unless indicated otherwise, ages are on unabraded fragments of wood charcoal. In each sample, the largest, most angular, least decayed fragments of charcoal, wood, and/or herb parts were selected to minimize the chance of analyzing carbon much older than the host sediment. In most samples, fragments with root-like morphology were avoided to minimize the chance of analyzing roots much younger than the host sediment. Except for a few of the most delicate fragments, sediment adhering to fragments was removed with brushes or dental tools in distilled water at 12-50X. Most charcoal was picked directly from moist sediment collected from the trench wall. Asterisk indicates samples that were picked from 1-mm and/or 0.5-mm sieves following wet sieving of bulk sediment samples (50-800 g sediment).

Table S1. Radiocarbon data for samples from the Saddle trench

Field No.	Unit No.	Station (m)[1]	Radiocarbon Laboratory No.[2]	Lab-reported age (^{14}C yr BP at 1σ)[3]	Calibrated age (cal yr BP at 2σ)[4]	Sample weight (mg)[5]	^{13}C (‰)	Description of dated material[6]
SP98-14	8aAB	10.0, 5.0	Beta-123797	400±40	520-310	80 grams	-25.1	Charred wood and bark
ARN98-71A	7bA	9.5, 4.9	GX-26078	3600±40	4080-3720	25.1	-26.1	Charcoal fragments and seed case
ARN98-71C	7bA	9.5, 4.9	OS-25339	3710±45	4230-3900	63.7	-26.7	Unabraded charcoal twig*
ARN98-44A	7aA	12.05, 3.70	Beta-125682	3930±70	4530-4150	132.2	-23.4	Fragment
ARN98-44B	7aA	12.05, 3.70	OS-25276	3745±28	4230-3980	22.4	-23.0	Fragment
ARN98-67A	7aA	11.95, 3.53	OS-26215	>modern	--	26.5s#	-27.5	Decayed twig or root*
ARN98-67B	7aA	11.95, 3.53	OS-25278	3220±45	3560-3350	23.3	-24.6	Dense fragments*
ARN98-46	7aA	11.72, 3.52	Beta-125683	3020±50	3360-3060	53.2	-24.3	Fragments
ARN98-47	7aA	11.9, 3.4	OS-24906	3320±65	3700-3390	10.4s	-23.6	Two fragments
ARN98-48	7aA	12.03, 3.43	OS-25277	3760±40	4250-3980	18.2	-24.1	25 fragments *
ARN98-65	7aA	12.5, 3.12	Beta-125685	1880±40	1920-1710	19.2	-25.1	Fragments of charred wood
ARN98-64	6a	1.8, 6.23	OS- 24905	2230±50	2350-2120	16.8s	-23.9	Five fragments *
ARN98-78	3a	17.5, 2.5	OS-26206	28,900±870	--	4.5s#	-22.4	Eight fragments soft, decayed wood*

[1] Location (horizontal, vertical) on reference grid used to map west wall of trench. Superscripts on sample ages shown on Plates 1 and 2 are the digits of field sample numbers (first column). Superscripts on sample ages shown on Plates 1 and 2 are the final digits of field sample numbers (first column).

[2] Laboratories are: OS, National Ocean Sciences AMS Facility, Woods Hole Oceanographic Institution; GX, Geochron Laboratories, Cambridge, Massachusetts (GX samples above analyzed on an accelerator at Lawrence Livermore National Laboratories); Beta, Beta Analytic, Inc., Miami, Florida.

[3] AMS (accelerator mass spectrometer) ages (methods described in Gagnon et al., 2000), except for sample SP98-14, which is a conventional liquid-scintillation age. Quoted error for each AMS analysis is the larger of counting error or target reproducibility error. NOSAMS' (OS-) tests of reproducibility on seawater and coral samples show total errors of 2.2-5.8% (Elder et al., 1998). Reported age for ARN98-44B is the average of two ages on the same charcoal fragment.

[4] Ages in solar years calculated using OxCal (version 3.4, Bronk Ramsey, 1998; probability method) and the INTCAL98 dataset of Stuiver et al. (1998). NOSAMS and Lawrence Livermore's (GX-) results from the Third International Radiocarbon Comparison show minimal offset from comparison means (e.g., Elder et al., 1998) suggesting that no additional interlaboratory variance (error multiplier; e.g., Taylor et al., 1996) is required for calibration. Although Beta Analytic, Inc. states that no additional error need be added to its ages for calibration, Beta's results from international radiocarbon comparisons remain unreported. Calibrated ages show time intervals of >95% probability distribution at 2σ. Ages shown on Plates 1 and 2 are midpoints of time intervals rounded to nearest 100 years.

[5] "s" indicates samples with adhering sediment when submitted; weight is a maximum for organic material in the sample. "#" indicates samples containing little (<150 ug) carbon.

[6] Unless indicated otherwise, ages are on unabraded fragments of wood charcoal. In each sample, the largest, most angular, least decayed fragments of charcoal, wood, and/or herb parts were selected to minimize the chance of analyzing carbon much older than the host sediment. In most samples, fragments with root-like morphology were avoided to minimize the chance of analyzing roots much younger than the host sediment. Except for a few of the most delicate fragments, sediment adhering to fragments was removed with brushes or dental tools in distilled water at 12-50X.. Most charcoal was picked directly from moist sediment collected from the trench wall. Asterisk indicates samples that were picked from 1-mm and/or 0.5-mm sieves following wet sieving of bulk sediment samples (50-800 g sediment).

TABLE CL2. Selected field and laboratory properties of soil profiles described in and around the Crane Lake trench

Sample No.	Horizon[1]	Average depth (cm)	Parent material[2]	Munsell color[3]	Boundary[1]	Volume percent[4] Pebbles	Cobbles	Weight percent[4] Sand	Silt	Clay	Loss on ignition[5]	Field texture[1]	Wet Consistence[1]	Structure[1]	Clay Films[1]
***Soil profile CL-S1** – 6 m north of north end of trench*															
	O	-4-0	F	10YR 2/1	a s	0	0	--	--	--	--	L	so/po	--	0
CL-3	A	0-5	C	10YR 4/2	a s	2	0	26	53	21	16.4	L	so/po	1 vf sbk	0
CL-4	BE	5-20	CD	10YR 4/3	c s	10	0	32	50	18	7.2	SiL	ss/ps	3 m sbk	0
CL-5	Bt2	20-35	CD	7.5YR 3/2	a s	5	0	35	47	18	6.7	SiL	ss/ps	2 m sbk	2 f pf
CL-6	2CB	35-50+	W	10YR 6/3	--	0	0	12	59	29	5.7	C	vs/vp	m	0
***Soil profile CL-S2**- station 26.5, units 13bA-1fCB*															
CL-18	A	0-20	C (13bA)	10YR 2/3d	c w	10	0	13	62	25	11.4	SiCL	ss/p	2 vf-f sbk	0
CL-19	Bt/E	20-34	CD (13aBt/E)	10YR 5/3d	c w	25	0	17	60	23	6.9	SiCL/S	s/p/so/po	3 f-m sbk/m	2 f pf/0
CL-20	2BC	34-57	W (1gBC)	2.5Y 7/4d	g w	0	0	32	52	16	6.3	SiCL	ss/p	1 vf sbk	0
CL-28	2CB	57+	W (1fCB)	5Y 6/3d	--	0	0	23	58	19	--	C	vs/vp	m	0
***Soil profile CL S3** – station 13.5 on inset trench log, units 13bA-12*															
CL-75	AO	0-5	C (13bA)	10YR 3/2d	a w	2	0	28	55	17	23.6	L	so/po	1 vf sbk	0
CL-63	AB	5-15	TC (13bAB)	7.5YR 3/3d	c w	5	0	22	52	26	11.6	SiL	ss/ps	2 m sbk	1 f pf
CL-64	Bw	15-37	T (13eBw)	7.5YR 4/4d	g w	2	<1	18	55	27	8.3	SiL	s/ps	2 f-m sbk	2 f pfpo
CL-65	BC	37-50	T (1gBC)	7.5YR 4/3d	g w	10	<1	19	55	26	7.7	SiL	s/ps	1 f sbk	1 f pfpo
CL-17	2CBb	50-68	T (1gBC)	10YR 5/4d	c w	10	<1	34	46	20	7.9	L	ss/ps	2 m sbk	1 f po
CL-10	3C	68-99	T (12)	10YR 5/2d	a w	<1	0	20	60	20	5.5	SiL	ss/ps	1 m sbk	v1 f po
														m	0
***Soil profile CL-S4** – station 6.5, units 7bA-4a*															
CL-74	OA	0-3	C (11bA)	10YR 3/2d	a w	2	0	64	31	5	25.8	L	so/po	1 f pl-sbk	0
CL-70	Bw1	3-24	CS (11bBw)	10YR 5/5d	g w	2	0	63	28	9	5.6	SL	ss/po	1 f-m sbk	v1 f po
CL-42	Bw2	24-42	SC (11b)	2.5Y 7/4d	c b	<1	0	63	28	9	5.0	SL	ss/po	1 f sbk	0
CL-67	Eb	42-62	S (4aE)	5Y 8/2d	a b	0	0	80	17	3	2.0	LS	so/po	m	0
CL-21	C	62+	S (4a)	2.5Y 6/4d	--	0	0	70	24	6	2.9	SL	so/po	m	0

[1]Horizon nomenclature, soil field properties, and terminology of Soil Survey Staff (1993) and Birkeland (1999). Abreviations: Boundary - a, abrupt; s, smooth; c, clear; w, wavy; g, gradual; Texture – S, sand; L, loam; SL, sandy loam; LS, loamy sand; C, clay; SiL, silt loam; SiCL, silty clay loam; Wet Consistence - so, nonsticky; ss, slightly sticky; s, sticky; vs, very sticky; po, nonplastic; ps, slightly plastic; p, plastic; vp, very plastic; Structure – m, massive; 1, weak; 2, moderate; 3, strong; vf, very fine; f, fine; m, medium; sbk, subangular blocky; Clay Films – v1, very few; 1, few; 2, common; 3, many; f, faint; po, in pores; pf, on peds. Profiles CL-S1 and CL-S2 described by Rick Koehler, 24 August 1999; profiles CL-S3 and CL-S4 by Alan Nelson, 13 September 1999.

[2]F, forest floor litter; C, colluvial deposit mixed primarily by roots and tree throw; T, colluvial deposit derived primarily from transport on a slope; D, glacial diamicton, either terrestrial or subaqueous; W, highly weathered bedrock or saprolite; S, stream (channel) deposit; two letters indicate a mixture of two genetic components. Unit label from Plate 1 in parentheses.

[3]Dominant moist or dry (d) color of horizon.

[4]Volume percentages visually estimated in the field to nearest 5-10%. Particle size distribution of <2 mm fraction using Malvern particle-size analyzer (Burman et al., 1997) with sample preparation and prior removal of organic matter methods of Singer and Janitzky (1986). Carbonate not removed and percent carbonate in cool, temperate forest assumed to be much less than 1%.

[5]Estimate of percent organic matter by loss on ignition (method of Storer, 1984).

TABLE BT2. Selected field and laboratory properties of soil profiles described in and around the Blacktail trench

Sample No.	Horizon[1]	Average depth (cm)	Parent material[2]	Munsell color[3]	Boundary[1]	Volume percent[4] Pebbles	Cobbles	Weight percent[4] Sand	Silt	Clay	Loss on ignition[5]	Field texture[1]	Wet Consistence[1]	Structure[1]	Clay Films[1]
***Soil profile BT-S1** – 8 m west of north end of trench, units 11eA-7cA*															
	O	-3-0	F	--	a w	0	0	--	--	--	--	L	so/po	--	0
BT-10	A	0-10	C (11eA)	2.5Y 4/2	a i	5	0	29	52	19	5.3	SiL	ss/sp	2 m gr	0
BT-11	E	10-20	C (11aB/E)	2.5Y 5/3	g w	5	0	22	61	17	4.0	SiL	ss/sp	2 m gr	0
BT-12	Bt	20-40	CM(9aAE)	2,5Y 4/4	c w	0	0	23	57	20	5.5	CL	s/p	2 c pl	0
BT-13	2ABb	40-65	MC (7cA)	2.5Y 3/2	a w	<1	0	18	60	22	6.0	SiC	vs/vp	3 vc sbk	v1 f pf
***Soil profile BT-S2** – trench station 5.1, units 11eA-7dA*															
	O	0-2	F	--	c s	0	0	--	--	--	--	L	so/po	--	0
BT-18	OA	2-13	C (11eA)	10YR 2/1	a s	5	0	17	65	18	23.5	SL	so/sp	1 f gr	0
BT-19	Bt1	13-23	CM(11eA)	10YR 2/2	a s	0	0	13	65	22	10.7	SiCL	ss/p	2 vf sbk	0
BT-20	Bt2	23-36	CM(9bB/E)	10YR 3/1	g w	15	0	21	59	20	7.8	SiC	s/p	3 m sbk	0
BT-21	2ABb	36-60	M (7dA)	10YR 5/6	--	0	0	12	63	25	5.6	C	vs/vp	2 c sbk	2 f pf

[1]Horizon nomenclature, soil field properties, and terminology of Soil Survey Staff (1993) and Birkeland (1999). Abreviations: Boundary - a, abrupt; s, smooth; c, clear; w, wavy; g, gradual; i, irregular; Texture - L, loam; SL, sandy loam; CL, clay loam; SiC, silty clay; C, clay; SiL, silt loam; SiCL, silty clay loam; Wet Consistence - so, nonsticky; ss, slightly sticky; s, sticky; vs, very sticky; po, nonplastic; ps, slightly plastic; p, plastic; vp, very plastic; Structure – 1, weak; 2, moderate; 3, strong; vf, very fine; f, fine; m, medium; c, coarse; vc, very coarse; sbk, subangular blocky; gr, granular; pl, platy; Clay Films – 1, few; 2, common; f, faint; pf, on peds. Profiles described by Rick Koehler, 30 August 1999.

[2]F, forest floor litter; C, colluvial deposit mixed primarily by roots and tree throw; T, colluvial deposit derived primarily from transport on a slope; M, lake mud; two letters indicate a mixture of two genetic components. Unit label from Plate 2 in parentheses.

[3]Dominant moist or dry (d) color of horizon.

[4]Volume percentages visually estimated in the field to nearest 5-10%. Particle size distribution of <2 mm fraction using Malvern particle-size analyzer (Burman et al., 1997) with sample preparation and prior removal of organic matter (methods of Singer and Janitzky, 1986). Carbonate not removed and percent carbonate not measured; percent carbonate in cool, temperate forest assumed to be much less than 1%.

[5]Estimate of percent organic matter by loss on ignition (method of Storer, 1984).

TABLE BL2. Selected field and laboratory properties of soil profiles described in the Bear's Lair trench

Sample No.	Horizon[1]	Average depth (cm)	Parent material[2]	Munsell color[3]	Boundary[1]	Volume percent[4] Pebbles	Cobbles	Weight percent[4] Sand	Silt	Clay	Loss on ignition[5]	Field texture[1]	Wet Consistence[1]	Structure[1]	Clay Films[1]
***Soil profile BL-S1** – station 13.4, units 11A-5d*															
98-80	A	0-10	C (9dA)	10YR 5/2d	c s	<10	0	49	35	16	10.9%	SiL	ss/ps	2 m sbk	0
98-81	Bw/C	10-30	CI (9dA/6E)	10YR 6/1d	a s	0	0	31	54	15	--	SiL	ss/ps	2 m sbk	0
98-82	2Btb	30-54	MC (5eBt)	2.5Y 6/2d	a w	<5	0	31	48	21	--	SiCL	ss/p	3 f abk	v1 f pf
98-83	3Btb	54-64	D (4eBt)	10YR 6/4d	a w	10	0	29	42	29	--	SL	ss/p	2 m sbk	2 d pobr
98-84	4Btb	64-114	D (4d)	2.5Y 7/3d	a w	10	3	30	50	20	--	SCL	ss/p	3 c abk	0
											--				
***Soil profile BL-S2** – station 3.5, units 11A-5, including monolith*															
--	A	0-5	CT (9dA)	10YR 3/3	a s	0	0	--	--	--	--	SiL	ss/ps	2 m gr	0
98-102	A/C	5-20	CT (9aA/6E)	10YR 7/2	a b	0	0	12	78	10	5.2	SiL	so/po	0-1 m sbk	0
98-104	Bw/C	20-25	TI (6E/9aA)	10YR 8/1	c b	0	0	15	70	15	4.5	SiL	ss/ps	2 m sbk	1 f po
98-103	CB	25-34	IT (6E)	10YR 8/1	a s	0	0	18	69	13	3.7	SiL	ss/po	1-2 m sbk	0
--	2CBb	34-41	CT (5a/6E)	10YR 6/2	a s	0	0	--	--	--	--	SiCL	ss/ps	2 f sbk	0
--	3BCb	41-47	CI (6E/5a)	10YR 7/1	a s	0	0	--	--	--	--	SiL	ss/po	3 m sbk	v1 f pf
98-105	4Ab	47-52	M (5cA)	7.5YR1.7/1	a s	0	0	19	59	22	14.1	CL	s/ps	3 f abk	0
BL-4	4ABb	52-56	M (5cA)	10YR 1.7/1	c s	0	0	15	68	17	6.6	SiCL	ss/ps	3 f-m pr	0
BL-1	4BtCb	56-66	M (5a)	10YR 4/1	c w	0	0	15	62	23	4.0	SiCL	s/ps	3 c pr	3 f pf
--	4CBb	66-87	M (5a)	5Y 5/3	a w	<1	0	--	--	--	--	SiCL	ss/ps	0-1 c abk	0
BL-2	5C	87-91+	D (4)	5Y 3/2d		10	0	40	42	18	--	L	so/po	0	0

[1]Horizon nomenclature, soil field properties, and terminology of Soil Survey Staff (1993) and Birkeland (1999). Abreviations: Boundary - a, abrupt; s, smooth; c, clear; w, wavy; g, gradual; b, broken; Texture - L, loam; SL, sandy loam; SCL, sandy clay loam; SiL, silt loam; SiCL, silty clay loam; Wet Consistence - so, nonsticky; ss, slightly sticky; s, sticky; po, nonplastic; ps, slightly plastic; p, plastic; Structure – 1, weak; 2, moderate; 3, strong; f, fine; m, medium; c, coarse; sbk, subangular blocky; abk, angular blocky; pr, prismatic; Clay Films – v1, very few; 1, few; 2, common; 3, many; f, faint; d, distinct; po, in pores; pf, on peds; br, bridges grains. Profile BL-S1 described by Rick Koehler and Charles Narwold, 29 September 1998. Profile BL-S2 samples collected from monolith (Brian Sherrod) or from same stratigraphic units within 2 m of monolith (Silvio Pezzopane) and described by Alan Nelson, September 2000.

[2]C, colluvial deposit mixed primarily by roots and tree throw; T, colluvial deposit derived primarily from transport on a slope; D, glacial diamicton, either terrestrial or subaqueous; M, lake mud; I, diatomite; two letters indicate a mixture of two genetic components. Unit label from Plate 2 is in parentheses.

[3]Dominant moist or dry (d) color of horizon.

[4]Volume percentages visually estimated in the field to nearest 5-10%. Particle size distribution of <2 mm fraction determined using a Malvern particle-size analyzer (Burman et al., 1997) with sample preparation and prior removal of organic matter (methods of Singer and Janitzky, 1986). Carbonate not removed and percent carbonate not measured; percent carbonate in cool, temperate forest assumed to be much less than 1%.

[5]Estimate of percent organic matter by loss on ignition (method of Storer, 1984).

TABLE ML2. Selected field and laboratory properties of soil profiles described in and around the Mossy Lane trench

Sample No.	Horizon[1]	Average depth (cm)	Parent material[2]	Munsell color[3]	Boundary[1]	Volume percent[4] Pebbles	Cobbles	Weight percent[4] Sand	Silt	Clay	Loss on ignition[5]	Field texture[1]	Wet Consistence[1]	Structure[1]	Clay Films[1]
Soil profile ML-S1 *- 30 m from north end of trench at 351°*															
	O	0-3	F	10YR 2/1d	a s	2	1	--	--	--	--	L	so/po	1 f-m pl	0
ML-22	A	3-8	CD	10YR 2/2d	a s	10	<1	29	53	18	19.7	SL	so/ps	1 vf sbk	0
ML-23	E/Bt	8-21	CD	10YR 6/3d	a s	20	5	29	52	19	6.9	SL/SiC	so/po/ss/p	m/2 f sbk	0-1 f po
ML-24	Bt1	21-38	CW	7.5YR 5/4d	c w	5	0	13	64	23	7.6	SiC	s/vp	3 m sbk	2 f pf
ML-25	2Bt2	38-70	CW	10YR 5/3d	g w	0	0	16	64	20	6.2	C	vs/vp	3 m sbk	2 f pf, 3 po
ML-26	3R	70-80+	W	5Y 5/3	--	0	0	5	67	28	--	C	vs/vp	m	0
Soil profile ML-S2 *– trench station 19.2, units 13-2*															
ML-40	AO	0-4	CF(6bAE)	5R 3/2	a s	0	0	24	58	18	21.8	SiL	so/ps	2 vf-f sbk	0
ML-41	AE	4-10	C (6bAE)	5Y 2.5/1	a s	0	0	20	59	21	15.3	SiL	so/ps	1 vf-f sbk	0
ML-42	Bt1	10-22	CD(6aBt)	10YR 3/2	c s	0	0	19	58	23	17.6	SiCL	ss/p	2 f-m sbk	0
ML-43	Bt2	22-35	CD(6aBt)	7.5YR 3/2	a s	0	0	19	60	21	8.1	SiC	vs/vp	3 m sbk	1-2 f po
ML-44	2Bt3	35-58	WC (1e)	10YR 4/2	a i	0	0	9	61	30	7.5	SiC	vs/vp	3 m sbk	2-3 f po-pf
ML-27	2R	58-100	W (1e)	5Y 5/3	--	0	0	12	59	29	--	C	vs/vp	m	0

[1]Horizon nomenclature, soil field properties, and terminology of Soil Survey Staff (1993) and Birkeland (1999). Abreviations: Boundary - a, abrupt; s, smooth; c, clear; w, wavy; g, gradual; i, irregular; Texture - L, loam; SL, sandy loam; SiC, silty clay; C, clay; SiL, silt loam; SiCL, silty clay loam; Wet Consistence - so, nonsticky; ss, slightly sticky; s, sticky; vs, very sticky; po, nonplastic; ps, slightly plastic; p, plastic; vp, very plastic; Structure – m, massive; 1, weak; 2, moderate; 3, strong; vf, very fine; f, fine; m, medium; sbk, subangular blocky; Clay Films – 1, few; 2, common; 3, many; f, faint; po, in pores; pf, on peds. Profiles described by Rick Koehler, 22 August 1999, with a few modifications by Alan Nelson.

[2]F, forest floor litter; C, colluvial deposit mixed primarily by roots and tree throw; T, colluvial deposit derived primarily from transport on a slope; D, glacial diamicton, either terrestrial or subaqueous; W, highly weathered bedrock or saprolite; two letters indicate a mixture of two genetic components. Unit label from Plate 2 in parentheses.

[3]Dominant moist or dry (d) color of horizon.

[4]Volume percentages visually estimated in the field to nearest 5-10%. Particle size distribution of <2 mm fraction using a Malvern particle-size analyzer (Burman et al., 1997) with sample preparation and prior removal of organic matter (methods of Singer and Janitzky, 1986). Carbonate not removed and percent carbonate not measured; percent carbonate in cool, temperate forest assumed to be much less than 1%.

[5]Estimate of percent organic matter by loss on ignition (method of Storer, 1984).

TABLE S2. Selected field and laboratory properties of soil profiles described in the Saddle trench

Sample No.	Horizon[1]	Average depth (cm)	Parent material[2]	Munsell color[3]	Boundary[1]	Volume percent[4] Pebbles	Cobbles	Weight percent[4] Sand	Silt	Clay	Loss on ignition[5]	Field texture[1]	Wet Consistence[1]	Structure[1]	Clay Films[1]
***Soil profile S-S1** - station 18.7, units 8eA-3aBt*															
98-90	A	0-10	C (8eA)	10YR 4/2d	c s	12	0	83	12	5	12.7	SL	so/po	1 f sbk	0
98-91	Bw	10-27	CT (8bBA)	10YR 5/3d	a s	10	1	47	37	16	4.7	SCL	ss/ps	2 f sbk	0
98-92	2BEb	27-49	C (6a)	10YR 3/2d	a w	0	2	53	35	12	7.7	SCL	s/p	3 m sbk	2 f pf
98-96	3Btb	49-69	C (5fBt)	7.5YR 4/3	a i	3	0	17	58	25	8.3	SiC	vs/p	3 m-c abk	2 d pf
98-98	4Btb	69-81+	DCW (3aBt)	2.5Y 5/2	--	1	0	28	48	24	--	SC	s/p	3 m-c abk	--
***Soil profile S-S2** - station 11.2, units 8eA-6bBE*															
98-87	A	0-10	T (8eA)	10YR 4/3	c s	10	0	59	23	18	13.4	SL	so/ps	2 f sbk	0
98-88	BE	10-25	T (8aAB)	10YR 5/3	c-g w	10	2	66	22	12	5.0	SL	ss/ps	2+ c sbk	0
98-89	2Bwb?	25-45+	T (8aAB)	10YR 4/3	c w	<10	2	20	68	12	7.5	SCL	ss/p	3 c sbk	3 f pf
98-93	3BEb	51-75+	T (6bBE)	10YR 8/4	--	5	0	19	61	20	3.8	SiL	ss/ps	1 f sbk	2 f cobr

[1]Horizon nomenclature, soil field properties, and terminology of Soil Survey Staff (1993) and Birkeland (1999). Abreviations: Boundary - a, abrupt; s, smooth; c, clear; w, wavy; g, gradual; i, irregular; Texture - L, loam; SL, sandy loam; SCL, sandy clay loam; SiC, silty clay; C, clay; SiL, silt loam; SiCL, silty clay loam; Wet Consistence - so, nonsticky; ss, slightly sticky; s, sticky; vs, very sticky; po, nonplastic; ps, slightly plastic; p, plastic; vp, very plastic; Structure – m, massive; 1, weak; 2, moderate; 3, strong; vf, very fine; f, fine; m, medium; c, coarse; sbk, subangular blocky; abk, angular blocky; Clay Films – 1, few; 2, common; 3, many; f, faint; d, distinct; po, in pores; pf, on peds; br, bridges grains. Profiles described by Rick Koehler and Charles Narwold, 1 October 1998, with a few modifications by Alan Nelson.

[2]C, colluvial deposit mixed primarily by roots and tree throw; T, colluvial deposit derived primarily from transport on a slope; D, glacial diamicton, either terrestrial or subaqueous; W, highly weathered bedrock or saprolite; two letters indicate a mixture of two genetic components. Unit label from Plate 2 in parentheses.

[3]Dominant moist or dry (d) color of horizon.

[4]Volume percentages visually estimated in the field to nearest 5-10%. Particle size distribution of <2 mm fraction determined using a Malvern particle-size analyzer (Burman et al., 1997) with sample preparation and prior removal of organic matter (methods of Singer and Janitzky, 1986). Carbonate not removed and percent carbonate not measured; percent carbonate in cool, temperate forest assumed to be much less than 1%.

[5]Estimate of percent organic matter by loss on ignition (method of Storer, 1984).